How to Swage Bullets

Dave Corbin

Bullet swaging is done by putting lead (and a jacket, if you are using one) into a strong, highly-polished swaging die, and compressing the material with high pressure, applied to two punches.

One punch slides up and down inside the die, to eject the bullet and to seal the threaded end of the die. This is called the *"internal" punch* (because it stays inside the die all the time). The other punch pushes the material into the die, applies pressure, and is removed so the bullet can be ejected. This is the *external punch.*

The die is a cylinder made of special die steel with a high carbide content, but with other alloys so it is not too brittle. It must hold very high pressures, often higher than rifle chamber pressures, without changing diameter.

Corbin builds a number of different diameters of dies, some for swaging only soft lead and some that can handle harder materials. Some of our dies are made to fit a regular reloading press. Others fit one of the models of presses that we build for swaging. You can tell which presses the die set fits by looking at the last letter in the catalog number. (-R, -M, -S, -H)

If it is -R, that means Reloading Press. If it is -M, that is the 3/4-inch diameter type for the discontinued, earlier model CSP-3 Silver Press, and also the CSP-1 vertical press. If the last letter is -S, it fits the CSP-1and is 1-inch diameter die. If the last letter is -H, the die set fits the Hydro-press (CHP-1), the Mega-Mite (CSP-2), or Hydro, Jr. (CSP-2H). These presses use dies from 1.5 to 3 inch diameter, with a 1-inch by 12 TPI threaded shank.

All Corbin presses accept the swage die in the ram, rather than the press head. (Drawing dies fit the press head.) A set may have from one to six dies, each with an internal and an external punch. The number of dies, and their purpose, depends on the bullet design.

Reloading press dies (-R) fit into the top of the press like a reloading die, and the punch snaps into the slotted ram like a shell holder.

The most simple kind of bullet to swage is a lead pistol bullet (or black-powder rifle bullet, which can be made the same way). The nose and base shapes are determined by the punch ends. A single die, called the LSWC-1 (with -M, -S, or -H ending, depending on the press) can make this kind of a bullet. You can also form it in the CS-1 core seater, but this die does not adjust the weight at the same time like the LSWC-1 does. We do not make LSWC-1-R dies for reloading presses (the bleed holes in the die would extrude lead into the press threads).

The type -R and -M dies are for use *with soft lead only.* The type -S dies can use up to Bhn 10 alloys, and the type -H dies can swage somewhat harder alloys depending on the shape and caliber. All the dies can make jacketed bullets, or lead ones.

The filling for a jacketed bullet is called the "core", and is made small enough to fit inside the jacket. The jacket is always made slightly under-sized so it can be swaged upward in diameter in each operation. That way, the tendancy of the jacket to return to original diameter, when the pressure is removed, works in your favor by gripping the core more tightly. Cores are either cut from a roll of lead wire, or cast from scrap lead in a core mould. Corbin has both core moulds and core cutters, as well as lead wire, available.

Each swaging step expands the jacket to slightly larger diameter, until the final stage results in the exact diameter you want. With a lead bullet, one or two stages (dies) are all the you need for virtually any bullet design.

Cut or cast a piece of lead of the approximate weight you want. In the EC-1-R die, or the BSD-xxx-R two-die sets, there is no lead bleed-hole to adjust the weight, but you can order an optional external punch with a bleed hole in it to adjust the core weight. Minimum weight is that which fills the cavity in the nose punch and leaves some for the shank of the bullet. Maximum weight of bullet will leave one caliber of punch length guided by the die cavity. In the LSWC-1- design, bleed holes in the sides of the die let you put in slightly heavier cores and extrude away the variations, resulting in a precise bullet weight.

No matter which die you start with, follow these instructions: Touch a drop of Corbin Swage Lube on your fingertips and spread a thin film on the lead core. Adjust the die (in a reloading press) or the external punch holder (in a Corbin press) so the punch does not press on the lead with the ram raised all the way. Put the lead core into the die, and gently raise the ram all the way. The slug MUST be smaller than the cavity in the die. In swaging, you always want to expand the material UP in diameter with each step, never drawing it down in size. *If the component mushrooms when you try to push it into the die, the component is too large for the die!*

With the ram at the top of the stroke, adjust the punch holder *(or the reloading press die)* closer to the ram, until you can't turn it by hand any further. This means that the lead slug is contacting the face of the external punch, and you are starting to compress the lead between the internal and external punches.

Lower the ram slightly, and turn the punch holder about a quarter turn lower. Raise the ram. Keep doing this until you start to feel some resistance on the handle of the press.

When you feel an increase in resistance, lower the ram and see if the core stays in the die. If not, repeat the quarter-turn lowering and checking until the core stays up in the die. That means it has expanded to the die diameter and is contacting the die walls.

IMPORTANT: Note that the bullet must be short enough so that the punch goes into the die at least one caliber length before any pressure is applied. If you feel pressure and the external punch is just starting into the die, stop. Your bullet is too long (or maybe the core is too long) for that combination of internal punch and die length. *Sometimes you can get more length of core into the die if we make a special internal punch, with a shorter head on it, so the punch goes further back away from the die mouth.*

To eject the bullet from any Corbin press, just lower the ram. With a reloading press, a steel rod is placed in the top of the die body, and you tap it with a plastic mallet to drive the internal punch down. Catch the bullet as it falls from the mouth of the die, and examine it. If it has flats and unformed areas, put it back in the die and swage it with tighter adjustment (more pressure). Note that you can turn the bullet over and swage the base into the nose and vice versa. This can give a more evenly formed bullet.

The finished bullet will take its diameter from the ID of the die. The nose and base shape are controlled by the internal and external punch. It isn't necessary to push a bullet all the way up against a punch: you can use two or more punches in succession to obtain shapes that neither punch would make by itself, by adjusting the die so that a given punch is only partly pressed into the lead.

Then, a second punch can be put into the ram and pushed partly into the lead. The combination produces yet another shape, part way between the two. A popular combination is a hollow point punch, and a round nose punch. A wide variety of shapes results from different degrees of insertion, and different order of use.

Since this kind of swage die forms the nose shape against a punch end, the edge of the punch must have some thickness to avoid cracking under the pressure. The thickness of the punch edge is the width of the shoulder between the bullet shank and the start of the nose. To eliminate any step or shoulder, use a "point-forming" die AFTER expanding the lead slug in the straight-walled "core-seater" die (a two-die set).

The point-forming die (PF-1) has the bullet shape machined into its cavity, and uses a tiny spring-wire ejection pin to shove the bullet out of the die. Because it forms the ogive or curve against the solid die wall, instead of inside a moving punch cavity, it eliminates the step, but it also needs the completely sealed chamber of the CS-1 (core seater) as a preparatory step, to generate sufficient pressure and assure that the shank is completely formed to diameter.

Using one of Corbin's swage presses means that you can also adjust the weight of the bullet precisely while you form a lead bullet, or swage a lead core for a jacket. Since swaging presses hold the die in the RAM, instead of in the press head, the die can have bleed holes drilled through the sides to extrude surplus lead. This is how the LSWC-1 die works with a lead bullet.

A similar kind of die with flat ended punches, and a bore size that produces a core which just slips into the proper jacket, is called the "core swage" die. It is used to prepare precision weight cores for use in other swaging operations.

In a reloading press, the die is in the press head and the holes would be lined up with the threads in the press, blocking them. Therefore, a core swage die for a reloading type press must have the bleed hole through the bottom punch, which is not as satisfactory a way to adjust the weight as having three radial holes around the circumference. Still, it works reasonably well.

Using any of the Corbin swage presses, a typical smooth-ogived jacketed bullet would be swaged in three steps. First, you'd insert the core swage die (CSW-1) and adjust the punch to produce a lead cylinder that, together with the jacket, weighed exactly what you desire in the final bullet. These cores of lead would be washed in a solvent, dryed and put into jackets by hand.

Second, you would put a small amount of Corbin Swage Lube on your fingertips and spread it on the jackets as you pick them up and put them in the core seating die (CS-1). The core seater has no bleed holes, and is just slightly below finished bullet diameter.

It is adjusted exactly as described previously, except that for open tip bullets, the punch slides down inside the jacket to compress the lead core, and for lead tip bullets or handgun style jacketed semi-wadcutters, the punch would fit the die cavity.

Finally, you would put a point forming die (PF-1) in the press ram, using a full bore size external punch. This die has a tiny hole at one end, and a bullet-shaped cavity. The small diameter ejection pin pushes the bullet out by its tip. The bullet shape is formed in the die walls, not a punch cavity. This avoids the step or shoulder. Apply just enough pressure to form the bullet as the stroke reaches the end of travel, and your bullet is done. Lead tip, rebated boattail, and dual diameter bullets are three other options.

The forming of a nice sharp lead tip can be done with a LT-1 lead tip forming die, after the ogive is formed in the point former. Only very light pressure is used in this operation to avoid putting a ring in the jacket. Some shapes of open tip bullets can be closed more tightly by gently pressing with a lead tip die and punch, but the angle of the punch cavity may need to be specially made for this operation.